

Integrated Three-Port Converters for Compact and Efficient Power Management, Phase II

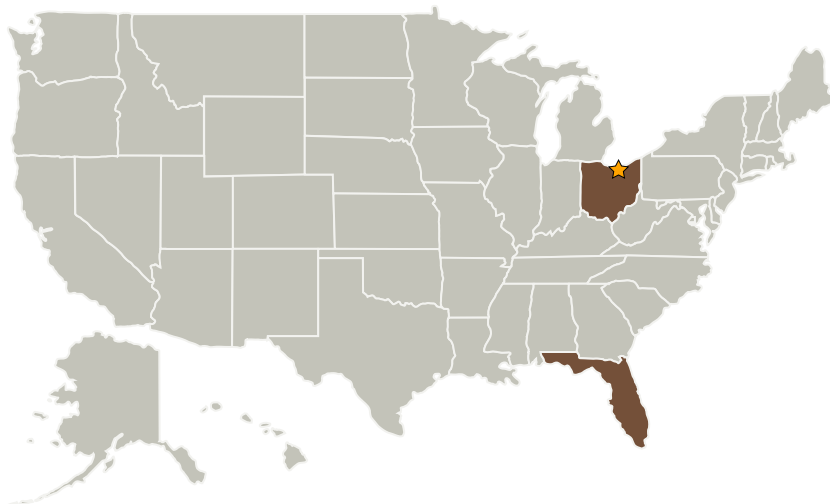
Completed Technology Project (2007 - 2009)



Project Introduction

To meet the increasing power demand of today's spacecraft systems, an integrated power electronics system capable of interfacing, and simultaneously controlling, three power ports is proposed in this project. This new proposed power electronic architecture employs a single-stage power topology, thus allowing cost-effective control of power flow with improved efficiency, power density, and reliability. The project is developing an innovative, dc-dc converter which can effectively manage the interface of a source, a load, and an energy storage function within a single-stage, three-port topology. Modern advances in digital control, in conjunction with a novel power processing concept make this logical next-step possible. This unique topology and controller function together to realize three power processing paths which simultaneously utilize the power devices, allowing increased functionality while promising reduced losses and enhanced power densities. Control objectives include battery charge regulation, solar array peak power tracking, and/or load voltage regulation. The Phase I efforts completed the preliminary analysis and the proof-of-concept prototyping. A demonstration test was successfully conducted substantiating feasibility. Phase II will focus on system level control in order to demonstrate the concept in a relevant application with a solar array source, a lithium-Ion battery, and an electronic load bank as the bus.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
APECOR	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Orlando, Florida

Primary U.S. Work Locations

Florida	Ohio
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Project Transitions

**November 2007:** Project Start**November 2009:** Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.3 Power Management and Distribution
 - └ TX03.3.1 Management and Control